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(21) International Application Number: PCT/US92/09148 (22) International Filing Date: 22 October 1992 (22.10.92) (30) Priority data: 782,413 25 October 1991 (25.10.91) US (71) Applicant: INTERFACE, INC. [US/US]; P.O. Box 1503, Orchard Hill Road, La Grange, GA 30241 (US). (72) Inventors: TERRY, C., Edward ; 300 Ivydale Drive, La Grange, GA 30240 (US). FULLER, Richard ; 804 North Greenwood Street, La Grange, GA 30240 (US). HOWE, Michael, A. ; 701 Underwood Drive, La Grange, GA 30240 (US). STILLWELL, Stacey ; Route 1, Box 202, Newell, AL 36270 (US).		(74) Agent: CROWLEY, Richard, P.; P.O. Box 901, 901 Main Street, Osterville, MA 02655-0901 (US). (81) Designated States: AU, BR, CA, JP, KR, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, SE). Published <i>With international search report.</i>
(54) Title: METHOD FOR PRODUCING TUFTED AND BONDED CARPET MATERIAL AND THE CARPET SO PRO- DUCED (57) Abstract A method for the combined preparation of a tufted and a bonded carpet material which method comprises bonding the top surface of a fibrous, tufted face surface of the tufted carpet material to a layer of an adhesive material secured to a backing layer to form a sandwich-type material, and splitting the sandwich-type material to provide for tufted carpet material and a bonded carpet material, each having a severed, fibrous face wear surface.		

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DESCRIPTION

Method for Producing Tufted and Bonded
Carpet Material and the Carpet So ProducedBackground of the Invention

5 Carpet material used as a surface covering generally comprises a tufted carpet material known as tufted greige goods, or a bonded carpet material, such as a fusion-bonded carpet material. Greige carpet comprises an uncolored or precolored yarn tufted into a primary backing sheet.
10 (not precoated). Carpet tiles are usually prepared by bonding a backing to either the tufted carpet material or the fusion-bonded carpet tile material.

Tufted carpet material is typically prepared by employing yarns together with a primary backing sheet
15 and sending the material through one or more tufting machines, such as for example, a tufting machine to provide for the desirable tufting to produce a cut pile, loop pile or combination thereof. The tufted greige carpet material may then be precoated on the back surface, such
20 as typically by carboxylated styrene-butadiene latex precoat to secure the tufted carpet to the primary backing sheet.

Generally, tufted greige carpet material is tufted in a range of about 12 to 70 ounces of fiber per square
25 yard, for example from about 16 to 32 ounces per square yard, and the yarn may be of natural or synthetic material and typically may be a precolored or a white yarn. Tufted carpet material is desirable in that graphics or other patterns can be formed on the fibrous face surface either
30 during the original tufting operation or by an overtufting operation to provide for design capabilities to the tufted carpet material. The tufted product for example made with a white or light-colored yarn can also be continuously dyed or printed to provide for a desirable pattern or
35 design thereon.

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Bonded or fusion-bonded carpet material provides for a very high density wear surface at a low cost and comprises the insertion of fibrous yarns into an adhesive layer secured to a backing sheet material. Fusion-bonded or bonded carpet material is generally prepared either from folded yarn insertion, resulting in a "U" tuft, or cut yarn insertion, resulting in an "I" tuft, wherein a non-woven, glass fiber fleece material and a woven material, such as a glass scrim material, are generally coated with an adhesive layer material, but typically comprising a PVC compound, a hot-melt adhesive-type material or a water-based adhesive.

In one embodiment, a pleater bar pleats yarn materials and the one surface of the pleated fibrous material is inserted into the PVC layer which is then heated to fuse the PVC layer. The process is repeated to insert the other surface of the pleated yarn material into a thermoplastic layer, heated and then to split the layer of fibrous material to produce two rolls of fusion-bonded carpet, each having a cut, fibrous face wear surface. Fusion-bonded carpet may also be formed by a vertical technique wherein the pleated yarn has an adhesive layer and backing material on each side, and is passed through a pair of vertical heaters and then split. In another technique, the yarn may merely be inserted at one end into the adhesive layer material to form a fusion-bonded carpet material.

Fusion-bonded carpet material is characterized by toughness and high fiber density. However, the fusion-bonded processes do not permit design flexibility in providing for a pattern or design on the fibrous face wear surface of the fusion-bonded carpet material. Typically, design surfaces are printed onto the fibrous face surface of the fusion-bonded carpet material, which is not wholly desirable.

It is desirable to provide for a new and improved method of producing a combined tufted and fusion-bonded carpet material, particularly a carpet material having

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a tufted design pattern on the face wear surface thereof, which new method is more efficient and provides for greater capability to turn out unique tufted products at a high speed operation with cost savings. The resulting tufted and fusion-bonded carpet material may be usefully employed by applying a backing layer to the tufted or fusion-bonded carpet material, which could optionally be cut into tiles..

Summary of the Invention

The invention is concerned with a method for the combined preparation of a tufted and a bonded carpet material and to the tufted and bonded carpet material produced therefrom. In particular, the invention is directed to a method for the combined preparation of a tufted and a fusion-bonded carpet material having a design pattern on each of the fibrous face surfaces and to the carpet and carpet tile material produced thereby.

A method for the combined preparation of a tufted and a bonded carpet material has been discovered which method comprises bonding the fibrous tufted face surface of a tufted carpet material to a layer of an adhesive material secured to a backing layer to form a sandwich-type material, and thereafter severing, such as by splitting, the fibrous tufted layer of the sandwich-type material to provide for separate tufted carpet material and fusion-bonded carpet material, each of which carpet materials has a separate, fibrous, split face wear surface.

The method is particularly adapted for the combined preparation of a tufted and a fusion-bonded carpet material wherein a preselected design, imparted to the tufted carpet material can then be imparted to the fusion-bonded carpet. Generally, where the tufted carpet greige goods material employed in the process has been tufted to a particular design or overtufted to a particular design, the method and the resulting carpet material of the method overcomes many disadvantages of the prior art in connection with preparing pattern or design fusion-bonded carpet material.

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The method of the invention employs a tufted carpet material as one layer of a sandwich-type carpet material, and particularly a tufted carpet material, such as a carpet greige material or a precoated material, which has been tufted in a particular design or pattern, or even more particularly, overtufted in a particular design, and which design or pattern is desired to be imparted to the other part of the sandwich-type carpet material, to wit, to the fusion-bonded carpet material. The method overcomes the disadvantages associated with imprinting a design or pattern on the fibrous face surface of fusion-bonded carpets, and permits the preparation of fusion-bonded carpets with a wide variety and capability for unique designs or patterns on the face wear surface thereto.

In addition, in the preparation of conventional fusion-bonded carpet material, either in the U-bond process where the yarn is placed in a corrugated form prior to being inserted into a thermoplastic adhesive layer, or in the I-bond process where the ends of the fiber are implanted into an adhesive layer, the pleating and insertion steps of the process are relatively slow speed steps which limit the efficient production of the fusion-bonded carpet material. The employment of a tufted, e.g. greige goods, carpet material in a fusion-bonding process in place of the corrugated, that is, the U-bond or I-bond insertion, permits a much higher speed operation together with the associated cost savings of such a manufacturing operation. Thus, the method of the invention provides for the preparation of both a tufted and a fusion-bonded unique carpet material in a high speed, cost-efficient operation and provides unique design or pattern capabilities for the resulting fusion-bonded carpet material.

The tufted carpet material employed in the method may comprise tufted carpet material usually produced by tufting yarns through a primary backing sheet to form a tufted or overtufted carpet with or without a design

or pattern on the tufted face wear surface. The tufted carpet may be cut, loop or a combination thereof pile on the fibrous face wear surface, and optionally may be precoated in order to secure the stitches to the primary
5 backing employing an adhesive precoat such as by the use of a carboxylated styrene-butadiene latex composition, or other type of latex or adhesive composition. The selected precoat composition should be compatible with the particular type of carpet backing layer to be employed
10 on the tufted carpet material, e.g. if used for carpet tile, for example an ethylene vinyl acetate precoat latex material, where the backing layer would be composed of a vinyl resin, like polyvinyl chloride.

In the method of the invention, a layer of adhesive
15 material is placed onto the surface of a mesh material, typically a glass scrim, adjacent to a non-woven glass fleece material, and then the top surface of the fibrous tufted sheet material inserted into the adhesive material layer. The adhesive layer may be composed for example
20 of a PVC plastisol which forms a viscous layer into which the closed loop or open ends of the fibrous tufted face surface of the tufted carpet material are inserted a short distance, e.g. 25% to 75% of the depth of the layer, and then the layer heated to gel and fuse the vinyl resin.
25 Where a thermoplastic hot-melt adhesive material is employed, e.g. modified ethylene vinyl acetate, then the hot-melt adhesive material is heated to form a layer, and after insertion of the fibrous face surface of the tufted carpet therein, the hot melt adhesive material
30 is then cooled to solidify the material to form the bonded, sandwich carpet material.

In another embodiment, the fusion-bonded carpet material may be prepared by the employment of a layer of a woven, synthetic fibrous screen-type mesh material,
35 such as a relatively closely woven polyester material, adjacent to a non-woven glass fleece material, which is then coated not with a thermoplastic vinyl or hot-melt adhesive material, but rather with a polymeric latex

composition, such as an ethylene vinyl acetate latex composition, subsequently heated and split to form a fusion-bonded carpet having a backing layer of a non-woven glass fiber tissue sheet laminated to a closely woven, screen-type polyester material and to a polymeric latex layer to which the fibrous face surface of the tufted fibrous face carpet has been inserted prior to heating.

After the preparation of the sandwich-type carpet material, the sandwich-type carpet material is severed, such as by the employment of a continuous band knife, for example, where a horizontal bonding process is employed or by an oscillating blade, more particularly where a vertical bonding process is employed, severing generally intermediate the tufted yarn across the plane or cross section of the fibrous tufted layer. The resulting method provides for a fusion-bonded carpet having a severed or split fibrous face wear surface and with any design pattern imparted by the tufted fibrous face surface of the tufted carpet material, and a precoated (optional) tufted carpet material having a cut fibrous face surface, either of the "U"-bond yarns or "I"-bond yarns, depending upon whether the tufted carpet material was cut, loop or combination pile fibers as the starting material. The tufted carpet material will also contain the original tufted or overtufted design or pattern on the fibrous face wear surface thereof.

The resulting fusion-bonded carpet material and the tufted carpet material prepared by the method is unique and may subsequently be back coated for use as broadloom or optionally, backed and cut to form carpet tiles. The fusion-bonded carpet and the tufted carpet material may be back coated in the usual manner by a vinyl resin, such as a plasticized PVC resin wherein the resin is then heated and fused to form a solid or foam backing layer or by the employment of a thermoplastic material, such as atactic polypropylene or bitumen, which bitumen may be a polymer-modified bitumen, such as a polyethylene-modified or a styrene-butadiene-styrene

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thermoplastic block copolymer-modified bitumen typically containing a limestone filler to form a backing layer. Alternately, a thermoset polyurethane solid or foam backing may be applied. Whether the backing layer is applied in one or two coats or is of a vinyl resin or of an atactic polypropylene or bitumen material, generally one or more layers of a glass fiber tissue or mesh-type material are employed within the backing layer to impart dimensional stability, and optionally a secondary backing sheet may be employed for example of glass fiber, polypropylene or polyester. For example, the carpet tile backing may be composed of a polyvinyl chloride backing with a glass fleece material inserted therein; The resulting backed carpet material may be then cut into carpet tiles.

The invention will be described for the purposes of illustration only in connection with certain embodiments; however, it is recognized that those persons skilled in the art may make various improvements, additions, modifications and changes in the described and illustrated embodiments, all falling within the spirit and scope of the invention.

Brief Description of the Drawings

Fig. 1 is a schematic, illustrative view of a method of preparing a fusion-bonded carpet and precoated, tufted carpet material of the invention.

Fig. 2 is an illustrative cross sectional view along line 2-2 of the precoated, tufted, greige carpet material used in the method of Fig. 1.

Fig. 3 is an illustrative, cross sectional view along line 3-3 of the sandwich carpet material prepared by the method of Fig. 1.

Fig. 4 is an illustrative, cross sectional view along line 4-4 of the fusion-bonded carpet material prepared by the method of Fig. 1.

Fig. 5 is an illustrative, cross sectional view of the fusion-bonded, tufted carpet material prepared by the method of Fig. 1.

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Fig. 6 is an illustrative, sectional view of a carpet tile material prepared employing the fusion-bonded carpet of Fig. 3.

Fig. 7 is an illustrative, sectional view of a carpet tile material prepared by the precoated, tufted carpet material of Fig. 4.

Fig. 8 is a schematic, illustrative view of an alternate method of preparing a combined tufted and fusion-bonded carpet material of the invention.

10 Description of the Embodiments

With particular reference to Figs. 1-4, there is shown a method for the preparation of a combined tufted 30 and fusion-bonded 20 carpet material of the invention with precoated tufted carpet material 10 (see Fig. 2) 15 having about 16 to 32 ounces per square yard of a fibrous face wear surface loop, predyed yarn 12 and 14, 14 being a different color than yarn 12 to form a pattern on the fibrous face surface. Undyed yarns can also be used for post-dyeing or a mix of predyed or undyed yarns may 20 be used to form the tufted design. The fibers 12 and 14 are tufted through a primary backing sheet 16, such as a polypropylene or jute sheet, and the ends of the yarn being secured by a latex precoat 18 applied to the back surface of the primary backing sheet 16. A mesh 25 material 24, such as a fiberglass, open scrim-type material, together with a non-woven glass fiber fleece material 26, such as a porous, resin-bonded, lightweight fleece material 26 is coated with a PVC resin 22 in two stages to form a viscous, liquid PVC plastisol layer 30 on the surface of the mesh sheet material 24 which penetrates through to the porous, non-woven glass fiber sheet material 26.

The closed loop top surfaces of the yarns 12 and 14 of the precoated tufted carpet material 10 are then 35 immersed in the viscous, liquid layer 22, the PVC coating applied in an amount ranging from about 35 to 60 ounces per square yard and the ends of the closed loops 12 and 14 inserted in the layer to a depth of about 40% to 60%

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and then heated through an oven or infrared heater 32 to gel and fuse the PVC layer 22 and to bond the top loops of the fibers 12 and 14 to the PVC layer 22 thereby forming a sandwich-type carpet material (Fig. 3) with the tufted yarns 12 and 14 tufted to the fibrous face material with the primary backing sheet 16 on one side of the sandwich and bonded to the PVC layer 22 on the other side which is backed with the woven glass 26 and the mesh glass 24.

10 The yarns of the resulting sandwich are then severed by an oscillating blade, knife or saw 36 generally intermittent the thickness of the tufted yarns 12 and 14 to provide a fusion-bonded carpet 20 (shown in Fig. 4) and a precoated tufted carpet material 30 (shown in Fig. 5). The fusion-bonded carpet 20 contains a thermoplastic adhesive layer 22 of PVC in which the top loops of the fibers 12 and 14 are bonded, a open mesh material 24 and a glass fiber tissue material 26 laminated to the PVC layer 22, and with the tops of the fibers 12 and 14 severed by the oscillating blade 36.

Fig. 4 shows the fusion-bonded carpet 20 with fibers 12 and 14 forming a design on the face wear surface. The design of the tufted carpet 10 by the fibers 12 and 14 is retained in the tufted carpet 30 and transferred in part to the bonded carpet 20.

Fig. 5 shows the precoated tufted carpet material 30 which comprises a primary backing sheet 16 with a precoat layer 18 with the closed loop, fibrous yarns 12 and 14 now surface cut to form a cut face wear surface with the original design thereon.

Fig. 6 is an illustration of carpet tile 40 prepared by the fusion-bonded carpet material 20, and Fig. 7 is a carpet tile 60 prepared by the precoated tufted carpet material 30, but each showing a backing layer 42 of a PVC resin with a layer of a fiberglass fleece material 44 for dimensional stability in the backing layer, and each having a secondary backing sheet 46, such as of polyester, polypropylene or glass fiber sheet material.

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Fig. 8 is an alternate method of preparing tufted and fusion-bonded carpet material of the invention in a vertical configuration wherein a feed roll of tufted, greige sheet material 50 is employed having a primary backing sheet 52 and a closed loop fibrous surfaces 54 on either side. A glass fiber tissue sheet material 56 is employed on either side, with one side having adhesive material 62, such as of PVC resin, coated onto the fiberglass tissue sheet material 56 by a blade 58, and the closed loops of each of the fibrous face surfaces 54 inserted in the PVC layer 62. On the opposite side, a precoat adhesive layer, such as a latex layer 60, is applied through a doctor blade 58 onto a glass fiber tissue sheet 56 and secured to the back surface of the primary back surface 52. The material is then sent through a pair of vertical heaters 64 to gel and fuse the PVC layer 62 and to heat and cure the precoat latex layer 60 to secure the glass fiber tissue sheet 56 to each back surface.

The sandwich material so prepared is then severed or cut with a blade 66 to provide a tufted carpet material 68 and a fusion-bonded carpet material 70, each having a cut fiber face wear surface. The carpet materials 68 and 70 may be used as a free lay carpet or back coated and cut into carpet tiles.

CLAIMS

Claim 1. A method for the combined preparation of a tufted carpet material and a bonded carpet material, each having a fibrous cut face wear surface, which method comprises:

- a) providing a first tufted carpet material comprising a primary backing sheet having a fibrous tufted face wear surface and a back surface and wherein the tufted carpet material has a tufted design pattern formed by variations in color or tufting on the fibrous face wear surface;
- b) bonding the fibrous face wear surface of the tufted carpet material to a layer of adhesive material secured to a backing layer to form a sandwich material; and
- c) splitting the bonded, fibrous, tufted layer of the sandwich material to provide a second tufted carpet material and a fusion bonded carpet material, each having a cut pile, fibrous face wear surface wherein the fusion bonded carpet material has the design pattern of the tufted carpet material on the cut pile, fibrous face wear surface.

Claim 2. The method of claim 1 wherein the first tufted carpet material has been overtufted to form a selected tufted design pattern upon the face wear surface and wherein the resulting second, tufted carpet material and the fusion bonded carpet material each has the selected, tufted design pattern upon the resulting cut pile, fibrous face wear surfaces.

Claim 3. The method of claim 1 which includes precoating the back surface of the first tufted carpet material to secure the fibrous ends of the tufted carpet to the back surface.

Claim 4. The method of claim 1 which includes splitting the fibrous tufted layer of the sandwich material generally intermediate the fibrous tufted layer.

Claim 5. The method of claim 1 wherein the backing layer comprises adjacent layers of an open mesh sheet material and a non-woven sheet material laminated to the back surface of the adhesive material.

Claim 6. The method of claim 1 wherein the first tufted carpet material comprises a tufted carpet material having a loop fibrous pile surface.

2 **Claim 7.** The method of claim 1 wherein the adhesive
material is selected from the group consisting of: a hot-melt
adhesive material, polyvinyl chloride and a polymer latex
4 composition.

2 **Claim 8.** The method of claim 1 wherein the first tufted
carpet material comprises a fibrous, closed loop, tufted face
surface having yarns of different colors wherein the tops of the
4 closed loop of the fibrous, tufted face surface are bonded to the
thermoplastic adhesive material to provide second tufted carpet
6 material with a cut pile, fibrous wear surface and a fusion
bonded carpet material with a cut pile U-bond face wear surface.

2 **Claim 9.** A fusion bonded carpet material having a cut pile,
fibrous face wear surface prepared by the method of claim 1.

2 **Claim 10.** A fusion bonded carpet material having a cut pile,
fibrous face wear surface with a fibrous design pattern thereon
prepared by the method of claim 3.

2 **Claim 11.** The method of claim 1 which includes applying a
polymer backing layer to the back of the fusion bonded carpet
material.

2 **Claim 12.** The method of claim 11 wherein the backing layer
is selected from the group consisting of: bitumen; atactic
polypropylene; polyvinyl chloride; modified ethylene vinyl
4 acetate; thermoplastic elastomer; or polyurethane.

2 **Claim 13.** The method of claim 11 which includes cutting the
fusion bonded carpet material with a backing layer to form carpet
tiles.

2 **Claim 14.** The carpet tile prepared by the method of claim
13.

2 **Claim 15.** A method for the combined preparation of a cut
pile, fibrous face tufted carpet material and a cut pile, fibrous
face bonded carpet material, each having a design pattern
4 thereon, which method comprises:

6 a) providing a first tufted carpet material comprising a
primary backing sheet having a fibrous tufted face wear
surface with a tufted design pattern thereon formed by
8 variations in color or tufting;

b) inserting and bonding a top portion of the fibrous face wear surface of the first tufted carpet material into a liquid adhesive layer on a mesh material and a non-woven glass fiber fleece backing sheet material adjacent to the mesh material to form a sandwich material; and

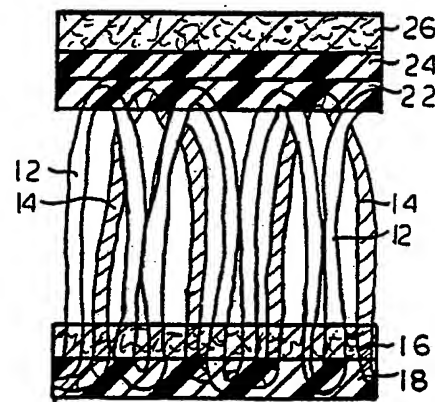
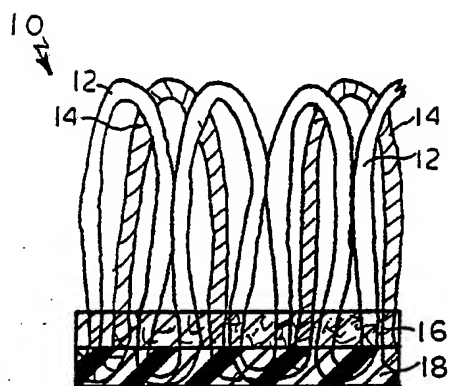
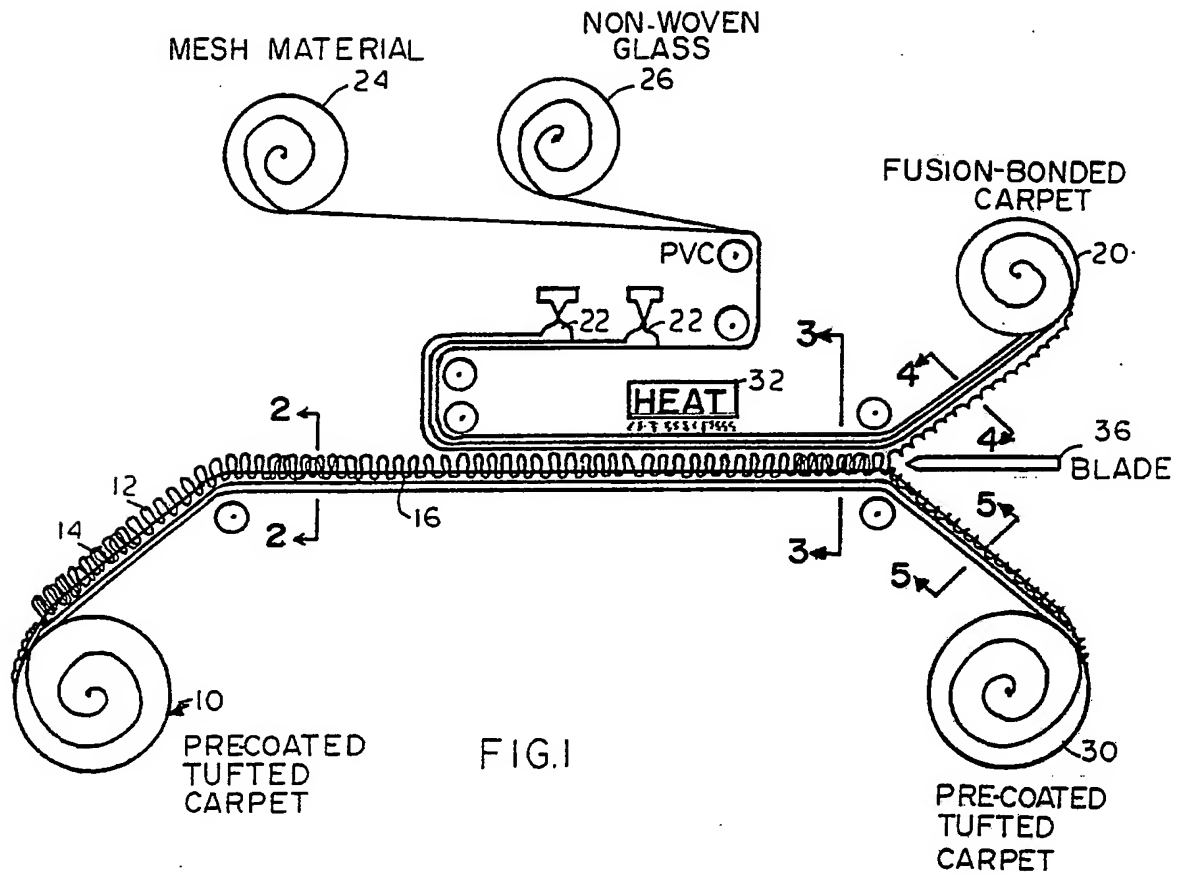
c) splitting the bonded fibrous tufted layer of the sandwich material generally intermediate the tufted layer to provide separately a second tufted carpet material having a fibrous, cut pile wear face surface with the said design pattern thereon, and a fusion bonded carpet material having a fibrous, cut pile wear face surface with the said design pattern of the first tufted carpet material thereon.

Claim 16. The method of claim 15 wherein the first tufted carpet material has either a loop, cut or combination of loop and cut yarn tufted face wear surface with a design pattern thereon formed by overtufting the first tufted carpet material.

Claim 17. The method of claim 15 which includes applying a solid backing layer to the second tufted carpet material or the fusion bonded carpet material, or both, and cutting the backed carpet material to form carpet tiles.

Claim 18. The fusion bonded carpet material prepared by the method of claim 15.

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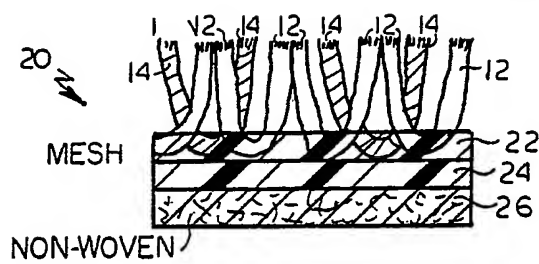


FIG. 4

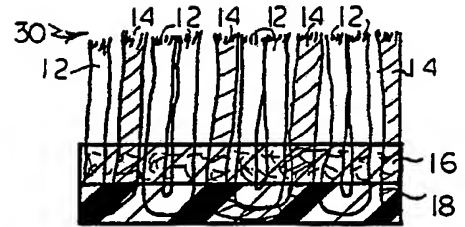


FIG. 5

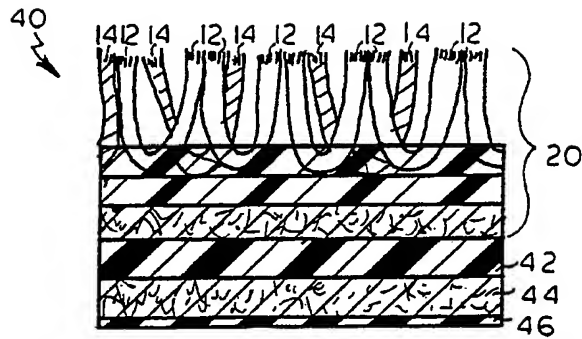


FIG 6

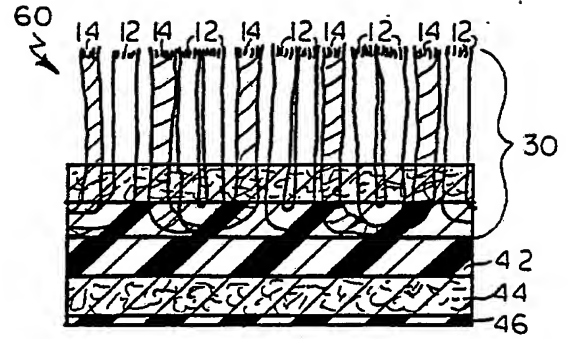


FIG 7

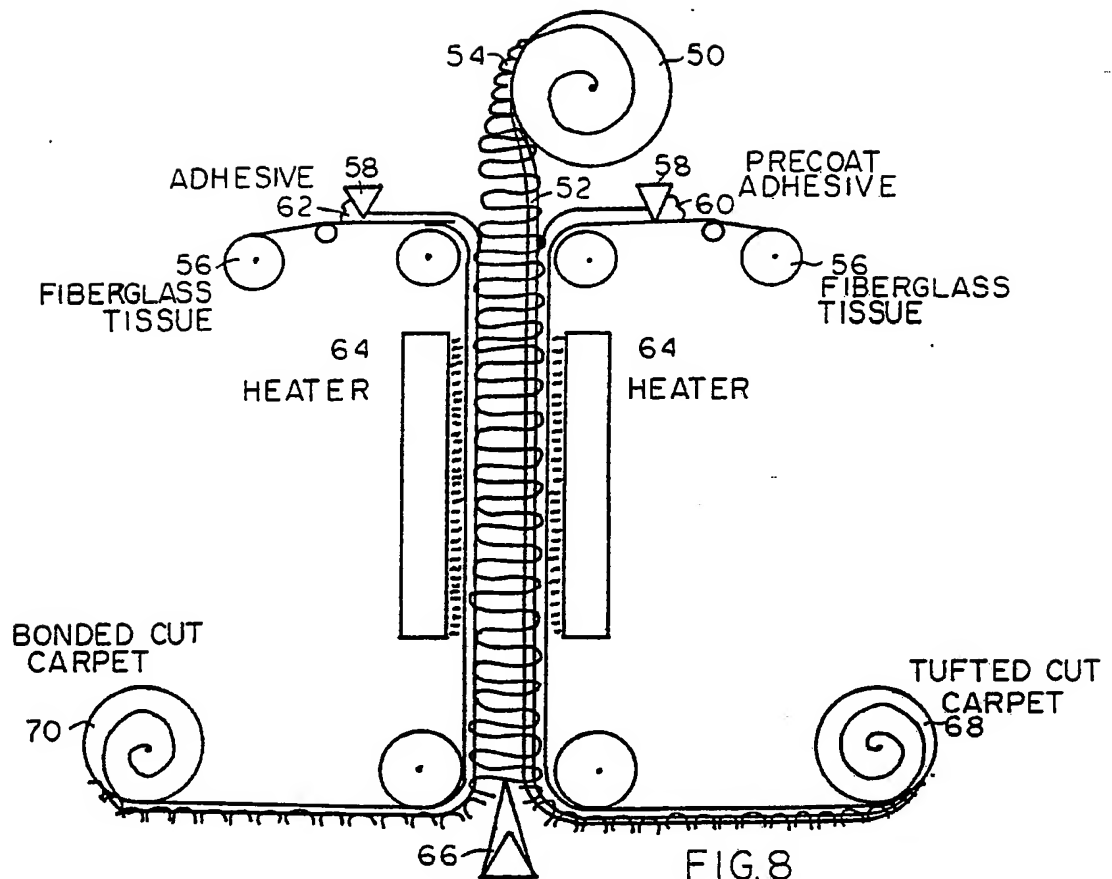


FIG. 8

INTERNATIONAL SEARCH REPORT

PCT/US 92/09148

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 A47G27/02; D04H11/04; D06N7/00

II. FIELDS SEARCHEDMinimum Documentation Searched⁷

Classification System

Classification Symbols

Int.Cl. 5

D06N ; D04H ; A47G

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched⁸**III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹**

Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	FR,A,2 238 582 (T. & A. NAYLOR LIMITED) 21 February 1975	1,4,7,9
A	see the whole document	5
Y	US,A,2 512 727 (WALTER A. RICE) 27 June 1950	1,4-7,9, 11-15, 17,18
Y	WO,A,9 000 967 (INTERFACE, INC.) 8 February 1990	1,4-7,9, 11-15, 17,18
	see page 7, line 27 - page 13, line 19; claims; figures	

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⁹ Special categories of cited documents: ¹⁰¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance¹⁰ "E" earlier document but published on or after the international filing date¹⁰ "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)¹⁰ "O" document referring to an oral disclosure, use, exhibition or other means¹⁰ "P" document published prior to the international filing date but later than the priority date claimed¹⁰ "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention¹⁰ "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step¹⁰ "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.¹⁰ "A" document member of the same patent family**IV. CERTIFICATION**

Date of the Actual Completion of the International Search

21 JANUARY 1993

Date of Mailing of this International Search Report

28. 01. 93

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

PAMIES OLLE S.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		Relevant to Claim No.
Category ^a	Citation of Document, with indication, where appropriate, of the relevant passages	
A	DE,A,2 249 875 (THE CARPET WOOL CO. LTD.) 19 April 1973 see page 2, last paragraph - page 3, paragraph 2; figures see page 4, line 4 - page 7, paragraph 2 -----	1,4,5,7, 9
A	GB,A,1 461 595 (BLACKWOOD, MORTON & SONS LTD.) 13 January 1977 see the whole document -----	1,4,7,9

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

US 9209148
SA 66560

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
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		BE-A- 818115	18-11-74
		DE-A- 2436182	13-02-75
		LU-A- 70612	10-12-74
		NL-A- 7410072	29-01-75
		SE-A- 7409753	28-01-75

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		JP-T- 3501397	28-03-91

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		AU-B- 473312	17-06-76
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